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The fundamental objective of this project is the development of a low-cost remotely deployable meteor radar system. This system will provide measurements of the neutral wind in the mesosphere and lower-thermosphere as determined using radio reflection from meteor trails. Our goal is to design, construct and deploy this system to Platteville Colorado to make continuous wind measurements.

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Final Technical Report

Low-cost, remotely-deployable meteor radar system for mesosphere/ionosphere coupling studies

Grant # F49620-98-1-0382

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Abstract: The fundamental objective of this project is the development of a low-cost remotely deployable meteor radar system. This system will provide measurements of the neutral wind in the mesosphere and lower-thermosphere as determined using radio reflection from meteor trails. Our goal is to design, construct and deploy this system to Platteville Colorado to make continuous wind measurements.

Status of Effort: Currently we have an operating 30MHz meteor radar at Platteville Colorado. This system consists of a 10kW transmitter, 6 receiver channels, a novel antenna switch, 4 6-element yagi and 4 cross-dipole antennae. In our original proposal we had planned to make 1 year of measurements from Platteville Colorado with this system. This was based on the concept that we would have an operational meteor radar available from our Russian colleagues, and this system would be upgraded. While upgrading the system we would also be making scientific measurements. During our first year of effort it became clear that the Russian system would not be available for our use and as a result we decided to design and construct a new meteor radar system. Consequently we were able to use the funds from this project, in addition to leveraging funds from elsewhere, to develop a newly designed meteor radar system. This new system is far superior in design and reliability to the old system. However, as is typically the case with all new systems, we have been constantly working to improve the reliability of the system. We also encountered significant delays in designing a new solid state antenna switch that could switch 10kW between antennae in under 100μs and in the development of a new software controlled data acquisition system. During the development of our new software controlled data acquisition system we have also added the capability to control the radar remotely. This remote control will enable us to check on the radar and to control it operation from virtually anywhere in the world provided communications are available. This is a vast improvement over the previous system that needed to be checked by an operator each day.

Results: To date our achievements have been with the design, development and deployment of new hardware and software to our Platteville Colorado research site. Shown below is some of the new hardware that we have developed.

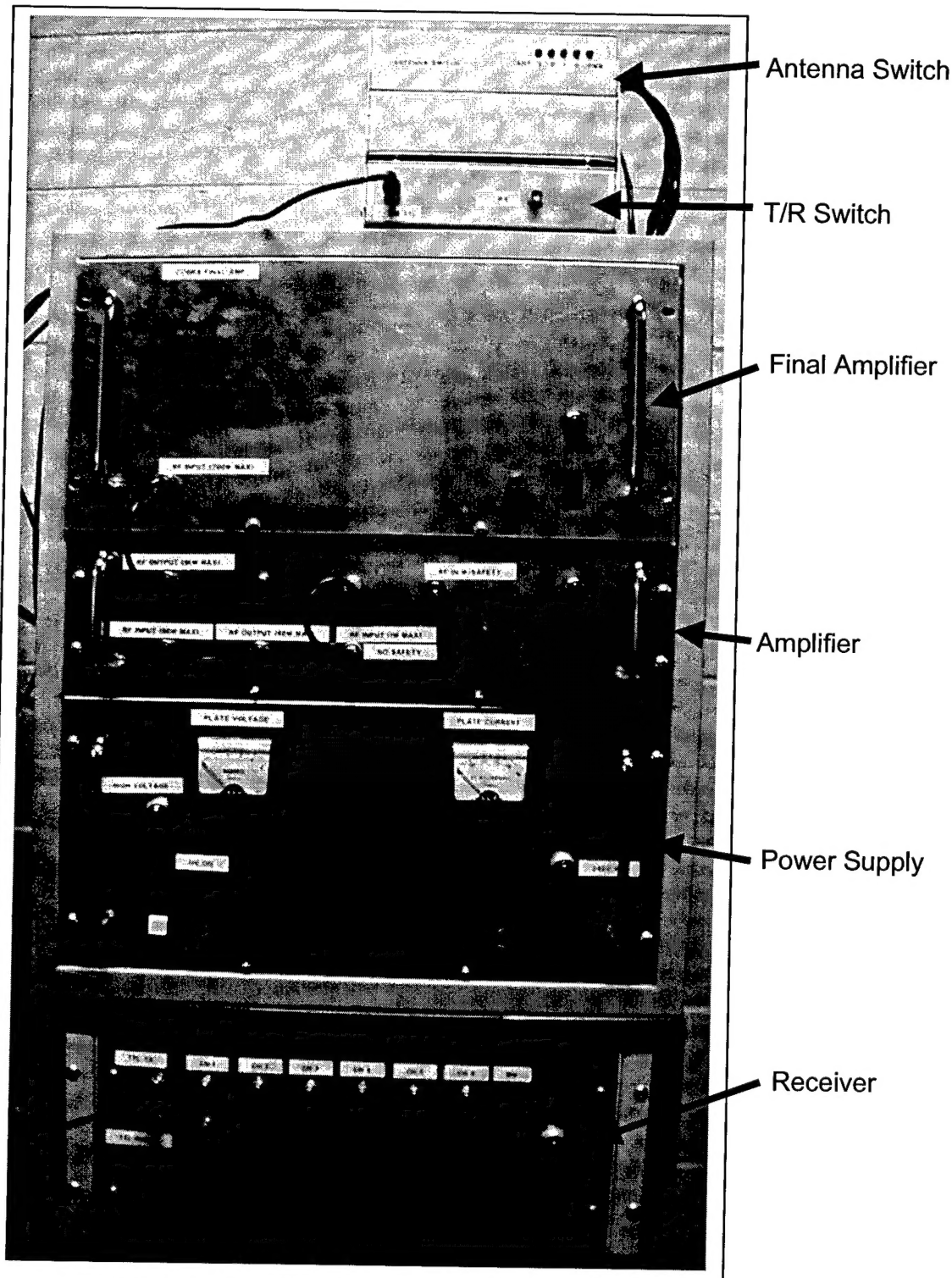

Figure 1: Our 30MHz meteor radar system

control the antenna switch to point the radar in the correct direction, collect the data and store it to disk for further remote processing.

Approximately two-months of data have been collected from our meteor radar system operating at Platteville, Colorado. We are currently in the process of writing the software to analyze these data. We expect to continue operating the radar and collecting data for the remainder of this year. Continued operation and upgrade of the system will depend upon future funding. However, it is our objective to conduct mesosphere/ionosphere coupling studies using the data collected from this system.

Presentations/Publications:

Palo, S.E., N.A. Makarov, J.M. Forbes, W.L. Ecklund, Yu.I. Portnyagin, and B. Petrov, **2000**: A low-cost, remotely-deployable meteor radar system for mesosphere/ionosphere coupling studies, 9th Workshop on Technical and Scientific Aspects of MST radar, Toulouse, France.

Palo, S.E., N.A. Makarov, J.M. Forbes, W.L. Ecklund, Yu.I. Portnyagin, and B. Petrov, A low-cost, remotely-deployable meteor radar system for mesosphere/ionosphere coupling studies, in preparation.